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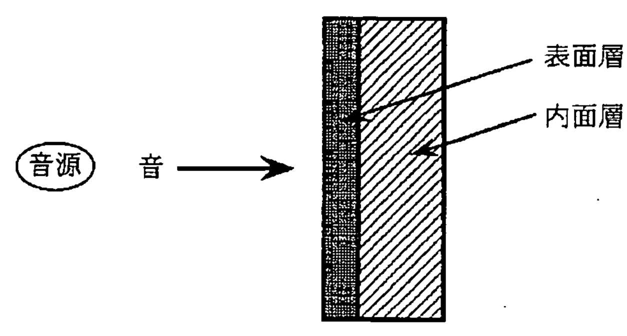
(54)【発明の名称】　遮音構造体

(57)【要約】
【課題】　超極細繊維不織布の持つ大きな特長である高吸音性を維持しつつ、ばね定数を低く抑えることで、高吸音性と高遮音性（低ばね化）が両立した自動車用遮音構造体を提供する。
【解決手段】　表面層と内面層とを有する遮音構造体である。表面層は、繊維径０．１～１０μｍの繊維から成る、平均見かけ密度０．０３～０．０６ｇ／ｃｍ^3、厚さ５～１５ｍｍのポリプロピレン製不織布である。内面層には表面層の厚さの２～５倍の厚さを持たせた。



【特許請求の範囲】

【請求項１】　繊維配合の異なる二層以上の繊維集合体から成る積層構造体であって、主たる音の入射面となる表面層がメルトブロー製法により得られる繊維径０．１～１０μmの繊維から成る平均見かけ密度０．０３～０．０６g／cm^3、厚さ５～１５mmのポリプロピレン製不織布であり、音の入射面に対して反対側に位置する内面層の厚さが上記表面層の２～５倍であることを特徴とする自動車用遮音構造体。

【請求項２】　上記積層構造体が、主たる音の入射方向から順に表面層、内面層及び背面層から成る三層構造を成し、この表面層と背面層とがメルトブロー製法により得られる繊維径０．１～１０μmの繊維から成る平均見かけ密度０．０３～０．０６g／cm^3、厚さ５～１５mmのポリプロピレン製不織布で構成され、上記内面層の厚さが上記表面層及び背面層のうちの厚さの厚い層に対して２～５倍であることを特徴とする請求項１記載の自動車用遮音構造体。

【請求項３】　上記内面層が、１～５０デニールの繊維径を有するポリエステル繊維から成る平均見かけ密度０．０１～０．０７g／cm^{3}のポリエステル不織布であることを特徴とする請求項１又は２記載の自動車用遮音構造体。

【請求項４】　上記内面層を構成する不織布が少なくとも２種類のポリエステル繊維から成り、６０～９５重量％を占める繊維１がポリエチレンテレフタレート繊維であり、５～４０重量％を占める繊維２が鞘部の融点が繊維１のそれより１００℃以上低い共重合ポリエステルである芯鞘構造を有するポリエステル繊維であることを特徴とする請求項３記載の自動車用遮音構造体。

【請求項５】　上記積層構造体全体の厚さが２０～５０mmであることを特徴とする請求項１～４のいずれか１つの項に記載の自動車用遮音構造体。

【請求項６】　車両のダッシュインシュレーター又はフロアインシュレーターとして用いることを特徴とする請求項５記載の自動車用遮音構造体。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、高性能の自動車用遮音構造体に係り、更に詳しくは、高い吸音性能と遮音性能を両立させた自動車用遮音構造体に関するもので、自動車用吸遮音材、フロアーインシュレーター及びダッシュパネルに取り付けられる自動車用ダッシュインシュレーター等の自動車用内装吸遮音材として好適に用いられる。

【０００２】

【従来の技術】近年、自動車用内装材、特にフロアインシュレーターやダッシュインシュレーターには良好な遮音性能と吸音性能が要求されており、従来、かかる自動車用遮音構造体としては、フェルトやウレタンフォームが使用されることが多かった。しかしながら、フェルトは、賦形性が悪いことに起因してパネルとの密着性が悪くなるので、一般的に吸遮音性能が劣る。また、フロアーインシュレーター等に使用されると、敷設されているワイヤーハーネス等による凹凸を吸収できないことがあり、カーペット表皮に凹凸が発生し、見栄えが悪くなることがある。更に、解繊した繊維には天然繊維が含まれているため、品質上の安定性に欠ける。加えて繊維間の結合が弱いために、経時的なへたりを生じるという欠点があった。

【０００３】一方、ウレタンフォームを遮音構造体として用いる場合には、カーペット表皮とウレタンフォームとの接着工程が必要となり、高コストとなる。発泡成形型中にカーペット表皮とウレタン発泡原料を投入して一体成形する方法も開発されているが、樹脂注入、発泡固着工程が必要となるため生産性が劣るほか、設備も大規模になり、また、ウレタン発泡材の原料を用いるため作業環境が悪く、排気設備も必要となる。更に、ウレタンフォームはリサイクルが困難であり、環境上問題となるため好ましくなく、フェルトに比べて硬いため遮音性能も劣っている。

【０００４】かかる欠点を改善するために、特開昭６２－２２３３５７号公報、特開平４－２７２２６３号公報及び特開平４－１８５７５４号公報には、ポリエステル等の合成繊維不織布を用いた遮音構造体が開示されている。ところで、熱融着繊維（バインダー繊維）を用いるサーマルボンドタイプの合成繊維製不織布は、バインダー繊維の配合量、繊維径、見かけ密度を変えることで、ばね定数や吸音性能をコントロールすることが可能である。即ち、共振点のチューニングが可能であり、ノイズ入力の大きな周波数と遮音構造体の共振点をずらすことで良好な遮音性能が得られる。

【０００５】しかしながら、ノイズ入力の大きな周波数が広い領域に亘る場合、共振点のチューニングのみでは遮音が不十分であり、遮音構造体の高ダンピング化が必要となる。ところが、従来のフェルトやウレタンフォームや合成繊維不織布を用いた遮音構造体で高ダンピングを実現するのは難しく、そのコントロールも困難なのが現状である。このため、遮音構造体を多層構造とし、構造体の一層をメルトブロー製法により得られる超極細繊維不織布から成る遮音構造体が考案されている（特願平７－１５１５４９号）。

【０００６】

【発明が解決しようとする課題】上記多層型遮音構造体を用いることにより、ダンピング性能に優れ、且つ、ダンピング特性のコントロールが可能である。しかしながら、この多層型遮音構造体では超極細繊維層が主たる音の入射面に対して反対側又は中間に位置するため、超極細繊維不織布のもつ大きな特徴である高吸音性が発揮できていない。また、超極細繊維不織布はもともと動ばね

定数が非常に大きく、超極細繊維層に対して他の層の厚さが十分確保されていない場合、ばね定数が増加し遮音性能が低下する等の課題があった。更に、吸遮音構造体の性能は主に吸音性能とばね特性で決まるが、この２つの性能は二律背反的な側面を持ち、高吸音性と低ばね化は両立が難しかった。

【０００７】本発明は、このような従来技術の有する課題に鑑みてなされたものであり、その目的とするところは、超極細繊維不織布の持つ大きな特長である高吸音性を維持しつつ、ばね定数を低く抑えることで、高吸音性と高遮音性（低ばね化）とを兼備した自動車用遮音構造体を提供することにある。

【０００８】

【課題を解決するための手段】本発明者らは、上記課題を解決すべく鋭意研究した結果、上述の如き超極細繊維不織布の高い吸音性能は膜共振吸音形態と多孔質構造吸音形態の二種類の吸音形態の混和に起因していることと、超極細繊維不織布の動ばね定数はそのほとんどを空気ばねが占めていることとを知見した。そこで、遮音構造体を多層化して超極細繊維不織布を主たる音の入射面となる表面層に配し、表面層の厚さや密度及び反対側に位置する内面層の厚さや密度等を特定したところ、上記課題が解決されることを見出し、本発明を完成するに至った。

【０００９】即ち、本発明の自動車用遮音構造体は、繊維配合の異なる二層以上の繊維集合体から成る積層構造体であって、主たる音の入射面となる表面層がメルトブロー製法により得られる繊維径０．１～１０μｍの繊維から成る平均見かけ密度０．０３～０．０６ｇ／ｃｍ^3、厚さ５～１５ｍｍのポリプロピレン製不織布であり、音の入射面に対して反対側に位置する内面層の厚さが上記表面層の２～５倍であることを特徴とする。

【００１０】

【作用】上述の如く、本発明者らは、ポリプロピレン製超極細繊維不織布の高い吸音性能は膜共振吸音形態と多孔質構造吸音形態の二種類の吸音形態の混和に起因していることと、ポリプロピレン製超極細繊維不織布の動ばね定数はそのほとんどを空気ばねが占めていることを解明した。

【００１１】即ち、ポリプロピレン製超極細繊維不織布は従来の合成繊維不織布に比べて繊維径が細いため繊維表面積が非常に大きく流動空気との摩擦が大きい。このためポリプロピレン製超極細繊維不織布は通気抵抗が極めて大きく、不織布の表層の一部が膜として作用し膜共振による吸音を起こしている。従来の合成繊維不織布にはみられない５００Ｈｚ付近の高い吸音性能は主にこのことに起因している。

【００１２】本発明では、ポリプロピレン製超極細繊維不織布を多層化した遮音構造体の主たる音の入射面となる表面層に配設することで膜共振により吸音を起こさせ、ポリプロピレン製超極細繊維不織布単独とほぼ同等の高い吸音性能を得ることができる。また、遮音構造体を主たる音の入射方向から順に表面層、内面層、背面層から成る三層構造体とし、表面層と背面層とをポリプロピレン製超極細繊維不織布とすれば、主たる音源のみならず反射音等に対しても高い吸音性能を持たせることができる。

【００１３】ところで、動ばね定数は繊維ばねと空気ばねで構成されているが、その高い通気抵抗性が災いしてポリプロピレン製超極細繊維不織布の空気ばねは繊維ばねに対して数倍から十数倍に達しており、ポリプロピレン製超極細繊維不織布単独では動ばね定数が非常に大きく遮音性能は低くなる。そこで、本発明では、ポリプロピレン製超極細繊維不織布の厚さに対して２～５倍の厚さを有する通気抵抗の小さいポリエステル繊維製不織布と積層し、遮音構造体全体の空気ばねを低下させることで動ばね定数を大幅に小さくしている。

【００１４】以上の知見より、本発明においては、遮音構造体を多層化し、主たる音の入射面となる表面層にポリプロピレン製超極細繊維不織布を配し、音の入射面に対して反対側に位置する内面層に、表面層に対して２～５倍の厚さを持たせることにより、優れた吸音性能と遮音性能を両立させることができる。

【００１５】

【発明の実施の形態】以下、本発明の自動車用遮音構造体について詳細に説明する。本発明の多層型遮音構造体は、上述のごとく、表面層と内面層とを備えるが、主たる音の入射面を表面層、音の入射面に対して反対側に位置する面を内面層と称する。また、三層構造をなす場合には、主たる音の入射方面から順に表面層、内面層及び背面層と称する。本発明の遮音構造体の構成の概略を図１及び２に示す。

【００１６】本発明の遮音構造体において、表面層及び背面層を構成する不織布はメルトブロー製法により得られる超極細繊維から成る。繊維の材質としては、コスト、製造の容易さからポリプロピレンが好ましい。また、内面層を構成する不織布は、コスト、成形性、耐久性、加工後の性能安定性等から判断してポリエステル繊維製であることが好ましい。

【００１７】また、上記表面層及び背面層はメルトブロー製法により得られる繊維径０．１～１０μｍの超極細繊維から成る不織布で構成することが必要である。これは、繊維径が０．１μｍ未満の繊維の入手が困難であり、また緩衝材としての剛性を得難く、他方、繊維径が１０μｍを超えると膜吸音を起こすほどの通気抵抗が得られず、吸音性能が悪化することがあるためである。

【００１８】表面層及び背面層の平均見かけ密度は，０．０３～０．０６ｇ／ｃｍ^{3}の範囲とすることを要す。平均見かけ密度が０．０３ｇ／ｃｍ^{3}未満では、フロアーインシュレーターとして用いられた場合、クッシ

ョン性が極端に低下し、内面層を硬くしても荷重時の沈み込みが生じることがある。また、０．０６ｇ／ｃｍ^{3}を超えると遮音性能、乗り心地等の低下が生じ、成形時の追従性も悪化することがあるためである。

【００１９】更に、表面層及び背面層の厚さは、５～１５ｍｍの範囲とすることを要す。この厚さが５ｍｍ未満では超極細繊維性不織布の効果が小さく、高い吸音性能は得られないことがある。他方、厚さが１５ｍｍを超えると積層体全体の厚さが厚くなりすぎて設置上問題となることがある。

【００２０】一方、内面層の厚さは、表面層の厚さの２～５倍とすることが必要である。三層構造の場合は、内面層の厚さは、表面層、背面層のうち厚さの厚い層に対して２～５倍とすることが好ましい。２倍未満では、超極細繊維製不織布の空気ばねを大きく低下させることができず、動ばねが大きくなり遮音性が劣ることがある。他方、５倍を超えると積層体全体の厚さが厚くなりすぎて設置上問題となることがあるためである。

【００２１】また、内面層を構成する不織布は１～５０デニールの範囲の繊維径を有する繊維から成ることが好ましく、また、平均見かけ密度が０．０１～０．０７ｇ／ｃｍ^{3}の範囲とすることが好ましい。繊維径が１デニール未満では適度なクッション性が得難く、また耐久性も低下することがある。更に、防糸速度が大幅に低下したり、カード通過性が悪く不織布の品質が悪化するおそれがある。他方、５０デニールを超えると不織布が硬くなり過ぎ、動ばね定数が大きくなり遮音性が低下することがある。また、平均見かけ密度が０．０１ｇ／ｃｍ^{3}未満では、クッション性、耐久性が大幅に低下し、０．０７ｇ／ｃｍ^{3}を超えると内面層の空気ばねが大きくなり超極細繊維製不織布の空気ばねを低下させることができず、遮音性が劣るほか、軽量化の要求にも反することになる。

【００２２】また、本発明においては、内面層を構成する不織布を少なくとも２種類のポリエステル繊維から構成し、６０～９５重量％の繊維１をポリエチレンテレフタレート繊維とし、５～４０重量％の繊維２を、鞘部の融点が繊維１のそれより１００℃以上低い共重合ポリエステルである芯鞘構造を有するポリエステル繊維とすることが好ましい。ここで、繊維１をポリエチレンテレフタレート繊維とするのは、バインダー繊維との融点の差を確保し、選択できるバインダー繊維の融点幅を広くするためである。

【００２３】また、繊維２はバインダー繊維として機能する。繊維２の鞘部の融点を繊維１より１００℃以上低くするのは、融点の差が１００℃未満であると表面層及び背面層を構成しているポリプロピレン性の超極細繊維の融点と重なってしまうため、成形時の温度条件が厳しくなるためである。場合によっては、超極細繊維が溶融し所期の性能が得られない可能性もある。融点差は大きすぎても問題になることはないので特に限定されるものではないが、１５０℃以上では繊維２の融点が下がりすぎて取扱が困難となる。また、繊維２の芯部の材質も特に限定されるものではないが、バインダー繊維として機能させやすくするために、ポリエチレンテレフタレートとするのが好ましい。

【００２４】繊維１を６０～９５重量％、繊維２を５～４０重量％とするのは以下の理由による。即ち、繊維１が６０重量％未満、繊維２が４０重量％を超えるとバインダー繊維量が多すぎてコストの上昇やクッション性の悪化を招くことがある。また、繊維１が９５重量％を超え、繊維２が５重量％未満であると、バインダー繊維量が少なすぎて成形性や耐久性が低下することがある。

【００２５】また、積層構造体全体の厚さは、良好な吸音、遮音性能を保ち、且つ設置上問題とならないように２０～５０ｍｍ程度とすることが好ましい。また、本発明の遮音構造体は、自動車等のダッシュインシュレーターやフロアーインシュレーターとして好適に用いることができる。

【００２６】

【実施例】以下、本発明を実施例、比較例及び従来例により更に詳細に説明するが、本発明はこれら実施例に限定されるものではない。

（実施例１）メルトブロー製法により得られる平均繊維径３μｍ、厚さ８ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合６デニール×５１ｍｍのポリエステル繊維：８０％、２デニール×５１ｍｍの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ２０ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００２７】（実施例２）メルトブロー製法により得られる平均繊維径３μｍ、厚さ８ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合２デニール×５１ｍｍのポリエステル繊維：８０％、２デニール×５１ｍｍの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ２０ｍｍ、平均見かけ密度０．０４ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００２８】（実施例３）メルトブロー製法により得られる平均繊維径３μｍ、厚さ８ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合２デニール×５１ｍｍのポリエステル繊維：８０％、２デニール×５１ｍｍの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ２０ｍｍ、平均見かけ密度０．０６ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００２９】（実施例４）メルトブロー製法により得られる平均繊維径３μm、厚さ８mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合１３デニール×５１mmのポリエステル繊維：８０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ３０mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００３０】（実施例５）メルトブロー製法により得られる平均繊維径３μm、厚さ８mm、平均見かけ密度０．０４ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合２デニール×５１mmのポリエステル繊維：８０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ２５mm、平均見かけ密度０．０６ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００３１】（実施例６）メルトブロー製法により得られる平均繊維径３μm、厚さ８mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合６デニール×５１mmのポリエステル繊維：９０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：１０％で厚さ２０mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００３２】（実施例７）メルトブロー製法により得られる平均繊維径３μm、厚さ８mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層及び背面層に、繊維配合６デニール×５１mmのポリエステル繊維：８０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ２０mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００３３】（実施例８）メルトブロー製法により得られる平均繊維径３μm、厚さ８mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層及び背面層に、繊維配合２デニール×５１mmのポリエステル繊維：８０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ２０mm、平均見かけ密度０．０４ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００３４】（実施例９）メルトブロー製法により得られる平均繊維径３μm、厚さ１０mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合２デニール×５１mmのポリエステル繊維：８０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ２０mm、平均見かけ密度０．０６ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に、メルトブロー製法により得られる平均繊維径３μm、厚さ６mm、平均見かけ密度０．０４ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を背面層に用い、積層して自動車用遮音構造体を作成した。

【００３５】（実施例１０）メルトブロー製法により得られる平均繊維径３μm、厚さ８mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合１３デニール×５１mmのポリエステル繊維：８０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ３０mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に、メルトブロー製法により得られる平均繊維径３μm、厚さ８mm、平均見かけ密度０．０４ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を背面層に用い、積層して自動車用遮音構造体を作成した。

【００３６】（従来例１）３０mmのクリアランスを有する注入発泡型内にポリオールとしてプロピレンオキサイド１，２，６－ヘキサントリオール：１００部、水：２部、界面活性剤：１部、カーボンブラック：０．５部から成るＡ液とトリレンジイソシアナート：１００部、シリコンオイル：０．５部から成るＢ液をポリオールに対してイソシアナート１．２５倍当量を低圧注入して発泡させ、厚さ３０mm、平均見かけ密度０．０６ｇ／ｃｍ^{3}のウレタンフォームを得て自動車用遮音構造体とした。

【００３７】（従来例２）豊和繊維工業製、厚さ３０mm、平均見かけ密度０．０６ｇ／ｃｍ^{3}のフェルト（商品名フェルトップ）を用い、自動車用遮音構造体とした。

【００３８】（従来例３）繊維配合６デニール×５１mmのポリエステル繊維：８０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ３０mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を用い、自動車用遮音構造体とした。

【００３９】（従来例４）メルトブロー製法により得られる平均繊維径３μm、厚さ３０mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を用い、自動車用遮音構造体とした。

【００４０】（比較例１）繊維配合６デニール×５１mmのポリエステル繊維：８０％、２デニール×５１mmの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ２０mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を表面層に、メルトブロー製法により得られる平均繊維径３μm、厚さ８mm、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超

極細繊維不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００４１】（比較例２）繊維配合６デニール×５１ｍｍのポリエステル繊維：８０％、２デニール×５１ｍｍの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ１０ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を表面層に、メルトブロー製法により得られる平均繊維径３μｍ、厚さ２０ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００４２】（比較例３）メルトブロー製法により得られる平均繊維径３μｍ、厚さ２ｍｍ、平均見かけ密度０．０４ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を表面層に、繊維配合６デニール×５１ｍｍのポリエステル繊維：８０％、２デニール×５１ｍｍの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ３０ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００４３】（比較例４）繊維配合６デニール×５１ｍｍのポリエステル繊維：８０％、２デニール×５１ｍｍの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ１０ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を表面層及び背面層に、メルトブロー製法により得られる平均繊維径３μｍ、厚さ１０ｍｍ、平均見かけ密度０．０４ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００４４】（比較例５）繊維配合６デニール×５１ｍｍのポリエステル繊維：８０％、２デニール×５１ｍｍの芯鞘タイプのバインダー繊維（鞘部融点１１０℃）：２０％で厚さ８ｍｍ、平均見かけ密度０．０５ｇ／ｃｍ^{3}のポリエステル製不織布を表面層及び背面層に、メルトブロー製法により得られる平均繊維径３μｍ、厚さ３０ｍｍ、平均見かけ密度０．０４ｇ／ｃｍ^{3}のポリプロピレン製超極細繊維不織布を内面層に用い、積層して自動車用遮音構造体を作成した。

【００４５】（性能評価）上記実施例１～１０、従来例１～３及び比較例１～５において得られた自動車用遮音構造体について１００～１６００Ｈｚの垂直入射吸音率を測定した。また、振動伝達率測定法を用いて共振周波数よりばね定数を求めた。振動伝達率測定法では大気中の測定から全体ばね定数が、真空中の測定から繊維ばね定数がそれぞれ求められ、その差が空気ばね定数となる。表１に各実施例、従来例及び比較例の物性データ、吸音率測定結果（５００Ｈｚ、１０００Ｈｚ）、及び各ばね定数測定結果を示す。

【００４６】

【表１】

	層	厚み mm	密度 g/cm3	主繊維	バインダー繊維	融点 ℃	吸音率 500Hz	1000Hz	ばね定数 全体ばね N/m	繊維ばね N/m	空気ばね N/m	総合評価（高吸音、低ばね）
実施例１	表面層	8	0.05	超極細繊維（3μm）			0.503	0.889	78,800	74,200	4,600	○
	内面層	20	0.05	6d ×51mm：80%	2d ×51mm：20%	110						
実施例２	表面層	8	0.05	超極細繊維（3μm）			0.533	0.883	54,300	39,000	15,300	○
	内面層	20	0.04	2d ×51mm：80%	2d ×51mm：20%	110						
実施例３	表面層	8	0.05	超極細繊維（3μm）			0.562	0.886	55,600	41,900	13,700	○
	内面層	20	0.06	2d ×51mm：80%	2d ×51mm：20%	110						
実施例４	表面層	8	0.05	超極細繊維（3μm）			0.612	0.902	72,300	71,100	1,200	○
	内面層	30	0.05	13d ×51mm：80%	2d ×51mm：20%	110						
実施例５	表面層	8	0.04	超極細繊維（3μm）			0.623	0.899	48,600	35,600	13,000	○
	内面層	25	0.06	2d ×51mm：80%	2d ×51mm：20%	110						
実施例６	表面層	8	0.05	超極細繊維（3μm）			0.512	0.896	76,500	72,600	3,900	○
	内面層	20	0.05	6d ×51mm：90%	2d ×51mm：10%	110						
実施例７	表面層	8	0.05	超極細繊維（3μm）			0.654	0.883	53,500	50,900	2,600	○
	内面層	20	0.05	6d ×51mm：80%	2d ×51mm：20%	110						
	背面層	8	0.05	超極細繊維（3μm）								
実施例８	表面層	8	0.05	超極細繊維（3μm）			0.688	0.855	40,600	32,000	8,600	○
	内面層	20	0.04	2d ×51mm：80%	2d ×51mm：20%	110						
	背面層	8	0.05	超極細繊維（3μm）								
実施例９	表面層	10	0.05	超極細繊維（3μm）			0.718	0.848	47,400	34,600	12,800	○
	内面層	20	0.06	2d ×51mm：80%	2d ×51mm：20%	110						
	背面層	6	0.04	超極細繊維（3μm）								
実施例１０	表面層	8	0.05	超極細繊維（3μm）			0.695	0.869	46,500	35,700	10,800	○
	内面層	30	0.05	13d ×51mm：80%	2d ×51mm：20%	110						
	背面層	8	0.04	超極細繊維（3μm）								
従来例１		30	0.06	ウレタンフォーム			0.189	0.463	96,100			×
従来例２		30	0.06	フェルト			0.201	0.479	65,700	56,200	9,500	×
従来例３		30	0.05	6d ×51mm：80%	2d ×51mm：20%	110	0.230	0.530	53,000	49,800	3,200	×
従来例４		30	0.05	超極細繊維（3μm）			0.633	0.798	341,000	42,900	298,100	×
比較例１	表面層	20	0.05	6d ×51mm：80%	2d ×51mm：20%	110	0.241	0.546	78,800	74,200	4,600	×
	内面層	8	0.05	超極細繊維（3μm）								
比較例２	表面層	10	0.05	6d ×51mm：80%	2d ×51mm：20%	110	0.290	0.665	258,000	76,000	182,000	×
	内面層	20	0.05	超極細繊維（3μm）								
比較例３	表面層	2	0.04	超極細繊維（3μm）			0.205	0.461	72,500	69,900	2,600	×
	内面層	30	0.05	6d ×51mm：80%	2d ×51mm：20%	110						
比較例４	表面層	10	0.05	6d ×51mm：80%	2d ×51mm：20%	110	0.264	0.623	153,600	49,300	104,300	×
	内面層	10	0.04	超極細繊維（3μm）								
	背面層	10	0.05	6d ×51mm：80%	2d ×51mm：20%	110						
比較例５	表面層	8	0.05	6d ×51mm：80%	2d ×51mm：20%	110	0.695	0.869	305,000	34,500	270,500	×
	内面層	30	0.04	超極細繊維（3μm）								
	背面層	8	0.05	6d ×51mm：80%	2d ×51mm：20%	110						

【００４７】表１より、実施例で作成された各種自動車用遮音構造体は、従来例に比べ、高い吸音率を維持しつつ、ばね定数が低く抑えられており、高吸音性と低ばね化が両立した自動車用遮音構造体であることが確認された。また、表１より、本発明の範囲にない比較例の自動車用遮音構造体は、高吸音性と低ばね化の両立が果たされておらず、実施例の自動車用遮音構造体に比し、性能が劣ることが確認された。

【００４８】

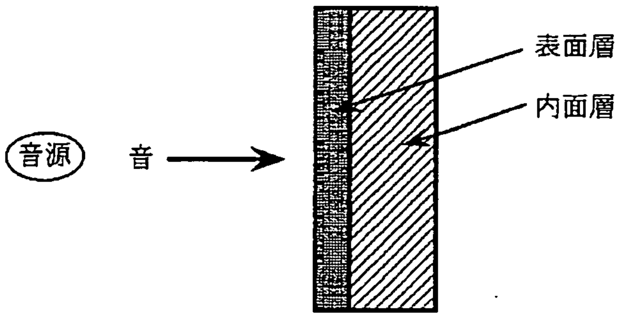
【発明の効果】以上説明してきたように、本発明によれば、遮音構造体を多層化し超極細繊維不織布を主たる音の入射面となる表面層に配し、表面層の厚さや密度及び反対側に位置する内面層の厚さや密度等を特定したため、超極細繊維不織布の持つ大きな特長である高吸音性を維持しつつ、ばね定数を低く抑えることで、高吸音性と高遮音性（低ばね化）が両立した自動車用遮音構造体を提供することができる。

【図面の簡単な説明】

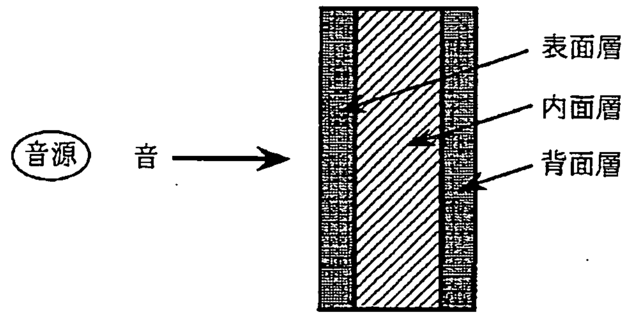
【図１】本発明の遮音構造体の構成例（二層）を示す概略図である。

【図２】本発明の遮音構造体の構成例（三層）を示す概略図である。

【図1】



【図2】



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CLAIMS

[Claim(s)]

[Claim 1] The sound-insulating-construction object for automobiles characterized by to be the laminating structure which consists of the fiber aggregate more than the bilayer from which fiber combination differs, for the surface layers used as the plane of incidence of a main sound to be the average apparent density gravity 0.03 which consists of fiber of 0.1-10 micrometers of diameters of fiber obtained by the melt blow process - 0.06 g/cm3, and a nonwoven fabric made from polypropylene with a thickness of 5-15mm, and for the thickness of the tapetum located in the opposite side to the plane of incidence of a sound to be 2 to 5 times the above-mentioned surface layer.

[Claim 2] The above-mentioned laminating structure constitutes 3 layer structures which consist of a surface layer, the tapetum, and a tooth-back layer sequentially from the direction of incidence of a main sound. It consists of average apparent density gravity 0.03 which consists of fiber of 0.1-10 micrometers of diameters of fiber from which this surface layer and a tooth-back layer are obtained by the melt blow process - 0.06 g/cm3, and a nonwoven fabric made from polypropylene with a thickness of 5-15mm. The sound-insulating-construction object for automobiles according to claim 1 with which thickness of the above-mentioned tapetum is characterized by being two to 5 times to a layer with the thick thickness of the above-mentioned surface layer and the tooth-back layers.

[Claim 3] The sound-insulating-construction object for automobiles according to claim 1 or 2 characterized by being the polyester nonwoven fabric of average apparent density gravity 0.01 - 0.07 g/cm3 with which the above-mentioned tapetum consists of the polyester fiber which has a 1-50-denier diameter of fiber.

[Claim 4] The sound-insulating-construction object for automobiles according to claim 3 characterized by being polyester fiber which has the sheath-core structure where the fiber 1 which the nonwoven fabric which constitutes the above-mentioned tapetum consists of at least two kinds of polyester fiber, and occupies 60 - 95 % of the weight is a polyethylene terephthalate fiber, and the fiber 2 which occupies 5 - 40 % of the weight is copolymerized polyester with the melting point of a sheath lower 100 degrees C or more than that of fiber 1.

[Claim 5] The sound-insulating-construction object for automobiles given in any one term of claims 1-4 characterized by the thickness of the above-mentioned whole laminating structure being 20-50mm.

[Claim 6] The sound-insulating-construction object for automobiles according to claim 5 characterized by using as the dash insulator or floor insulator of a car.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the sound-insulating-construction object for automobiles of high performance, and is suitably used about the sound-insulating-construction object for automobiles which reconciled the high absorption-of-sound engine performance and the noise insulation engine performance

in more detail as interior sound absorption and insulation materials for automobiles, such as a dash insulator for automobiles attached in the sound absorption and insulation material for automobiles, a floor insulator, and a dash panel.

[0002]

[Description of the Prior Art] In recent years, the good noise insulation engine performance and the absorption-of-sound engine performance are demanded of the interior material for automobiles especially the floor insulator, or the dash insulator, and the felt and urethane foam were conventionally used as this sound-insulating-construction object for automobiles in many cases. However, since formativeness originates in a bad thing and adhesion with a panel worsens, generally the felt is inferior in sound-absorbing-and-insulating ability. Moreover, when used for a floor insulator etc., irregularity by the wire harness laid may be unable to be absorbed, irregularity may occur on carpet epidermis, and appearance may worsen. Furthermore, since the natural fiber is contained in the fiber which ****(ed), the stability on quality is missing. In addition, since association between fiber was weak, there was a fault of producing setting with time.

[0003] On the other hand, in using urethane foam as a sound-insulating-construction object, the adhesion process of carpet epidermis and urethane foam is needed, and it becomes high cost. Although the approach of throwing in carpet epidermis and an urethane foaming raw material in a foaming mold, and really fabricating is also developed, since resin impregnation and a foaming fixing process are needed, productivity is inferior, and also in order for a facility to also become large-scale and to use the raw material of urethane foam, work environment is bad and an exhaust air facility is needed. Furthermore, preferably, since recycle is difficult and poses an environment top problem, since it is hard compared with the felt, the noise insulation engine performance is also inferior in urethane foam.

[0004] In order to improve this fault, the sound-insulating-construction object which used synthetic-fiber nonwoven fabrics, such as polyester, is indicated by JP,62-223357,A, JP,4-272263,A, and JP,4-185754,A. By the way, the thermal bond type nonwoven fabric made from a synthetic fiber using thermal melting arrival fiber (binder fiber) is changing the loadings of binder fiber, the diameter of fiber, and apparent density gravity, and can control a spring constant and the absorption-of-sound engine performance. That is, tuning of the resonance point is possible and the good noise insulation engine performance is obtained by shifting the resonance point of the big frequency of a noise input, and a sound-insulating-construction object.

[0005] However, when covering the field where the big frequency of a noise input is large, just the tuning of the resonance point of noise insulation is inadequate, and high damping-ization of a sound-insulating-construction object is needed. However, it is difficult for the sound-insulating-construction object using the conventional felt and urethane foam, or a synthetic-fiber nonwoven fabric to realize high damping, and the control is also difficult for the present condition. For this reason, a sound-insulating-construction object is made into multilayer structure, and the sound-insulating-construction object which consists of the microfiber nonwoven fabric obtained by the melt blow process in one layer of the structure is devised (Japanese

Patent Application No. No. 151549 [seven to]).
[0006]
[Problem(s) to be Solved by the Invention] By using the above-mentioned multilayer mold sound-insulating-construction object, it excels in the damping engine performance, and control of a damping property is possible. However, with this multilayer mold sound-insulating-construction object, since a microfiber layer is located in the opposite side or the middle to the plane of incidence of a main sound, the high absorption-of-sound nature which is the big description which a microfiber nonwoven fabric has cannot be demonstrated. Moreover, the microfiber nonwoven fabric had the very large dynamic spring constant from the first, and when the thickness of other layers was not enough secured to the microfiber layer, the spring constant increased and it had the technical problem of the noise insulation engine performance falling. Furthermore, although the engine performance of a sound absorbing and insulating structure was mainly decided by the absorption-of-sound engine performance and the spring property, these two engine performance had an antinomy-side face, and coexistence was difficult for high absorption-of-sound nature and the reduction in a spring.
[0007] Maintaining the high absorption-of-sound nature which is the big features which a microfiber nonwoven fabric has, the place which this invention is made in view of the technical problem which such a conventional technique has, and is made into the purpose is stopping a spring constant low, and is to offer the sound-insulating-construction object for automobiles which combined high absorption-of-sound nature and high insulation (reduction in a spring).
[0008]
[Means for Solving the Problem] As a result of inquiring wholeheartedly that this invention persons should solve the above-mentioned technical problem, the high absorption-of-sound engine performance of the microfiber nonwoven fabric like **** originating in mixing of two kinds of absorption-of-sound gestalten, a film resonance absorption-of-sound gestalt and a vesicular structure absorption-of-sound gestalt, and the dynamic spring constant of a microfiber nonwoven fabric carried out the knowledge of the air spring occupying the most. Then, the sound-insulating-construction object was multilayered and the microfiber nonwoven fabric was arranged on the surface layer used as the plane of incidence of a main sound, and when thickness, a consistency, etc. of the tapetum located in the thickness, the consistency, and the opposite side of a surface layer were specified, it came to complete a header and this invention for the above-mentioned technical problem being solved.
[0009] Namely, the sound-insulating-construction object for automobiles of this invention is the laminating structure which consists of the fiber aggregate more than the bilayer from which fiber combination differs. They are the average apparent density gravity 0.03 which consists of fiber of 0.1-10 micrometers of diameters of fiber from which the surface layer used as the plane of incidence of a main sound is obtained by the melt blow process - 0.06 g/cm3, and a nonwoven fabric made from polypropylene with a thickness of 5-15mm. It is characterized by the thickness of the tapetum located in the opposite side to the plane of incidence of a sound being 2 to 5

times the above-mentioned surface layer.

[0010]

[Function] Like ****, the absorption-of-sound engine performance of the microfiber nonwoven fabric made from polypropylene this invention persons being high originating in mixing of two kinds of absorption-of-sound gestalten, a film resonance absorption-of-sound gestalt and a vesicular structure absorption-of-sound gestalt, and the dynamic spring constant of the microfiber nonwoven fabric made from polypropylene solved that the air spring occupied the most.

[0011] That is, since the diameter of fiber is thin compared with the conventional synthetic-fiber nonwoven fabric, fiber surface area is very large and the microfiber nonwoven fabric made from polypropylene has large friction with flow air. For this reason, the microfiber nonwoven fabric made from polypropylene has very large ventilation resistance, a part of surface of a nonwoven fabric acted as film, and it has caused absorption of sound by film resonance. The high absorption-of-sound engine performance near 500Hz in which it does not see mainly originates in the conventional synthetic-fiber nonwoven fabric at this.

[0012] In this invention, absorption of sound can be made to be able to cause by film resonance by arranging in the surface layer used as the plane of incidence of the main sound of the sound-insulating-construction object which multilayered the microfiber nonwoven fabric made from polypropylene, and the high absorption-of-sound engine performance almost equivalent to the microfiber nonwoven fabric independent made from polypropylene can be obtained. Moreover, a sound-insulating-construction object can be made into the three-layer structure which consists of a surface layer, the tapetum, and a tooth-back layer sequentially from the direction of incidence of a main sound, and the high absorption-of-sound engine performance can be given for a surface layer and a tooth-back layer also to the microfiber nonwoven fabric made from polypropylene, then not only a main sound source but a reflected sound, etc.

[0013] By the way, although the dynamic spring constant consists of a fiber spring and an air spring, the high ventilation resistance nature suffered misfortune, the air spring of the microfiber nonwoven fabric made from polypropylene has reached about ten times from several times to the fiber spring, and the noise insulation engine performance becomes [a dynamic spring constant] very large low in the microfiber nonwoven fabric independent made from polypropylene. So, by this invention, a laminating is carried out to the small nonwoven fabric made from polyester fiber of the ventilation resistance which has one 2 to 5 times the thickness of this to the thickness of the microfiber nonwoven fabric made from polypropylene, and the dynamic spring constant is sharply made small by reducing the air spring of the whole sound-insulating-construction object.

[0014] The outstanding absorption-of-sound engine performance and the outstanding noise insulation engine performance can be reconciled by multilayering a sound-insulating-construction object, arranging the microfiber nonwoven fabric made from polypropylene on the surface layer used as the plane of incidence of a main sound, and giving one 2 to 5 times the thickness of this to the tapetum located in the opposite side to the plane of incidence of a sound from the above knowledge, to a surface layer in this invention.

[0015]
[Embodiment of the Invention] Hereafter, the sound-insulating-construction object for automobiles of this invention is explained to a detail. Although the multilayer mold sound-insulating-construction object of this invention is equipped with a surface layer and the tapetum like ****, it calls the tapetum the field located in the opposite side to the plane of incidence of a surface layer and a sound in the plane of incidence of a main sound. Moreover, in making 3 layer structure, it calls it a surface layer, the tapetum, and a tooth-back layer sequentially from the direction of incidence of a main sound. The outline of the configuration of the sound-insulating-construction object of this invention is shown in drawing 1 and 2.
[0016] In the sound-insulating-construction object of this invention, the nonwoven fabric which constitutes a surface layer and a tooth-back layer consists of the microfiber obtained by the melt blow process. As the quality of the material of fiber, the ease of manufacture to cost and polypropylene are desirable. Moreover, as for the nonwoven fabric which constitutes the tapetum, it is desirable that it is a product made from polyester fiber, judging from cost, a moldability, endurance, the engine-performance stability after processing, etc.
[0017] Moreover, the above-mentioned surface layer and a tooth-back layer need to constitute from a nonwoven fabric which consists of the microfiber of 0.1-10 micrometers of diameters of fiber obtained by the melt blow process. This is because ventilation resistance to the extent that film absorption of sound is caused will not be obtained if acquisition of less than 0.1-micrometer fiber is difficult, and its diameter of fiber is difficult to get in the rigidity as shock absorbing material and another side and the diameter of fiber exceed 10 micrometers, but the absorption-of-sound engine performance may get worse.
[0018] The average apparent density gravity of a surface layer and a tooth-back layer is **** about considering as the range of 0.03 - 0.06 g/cm3. When average apparent density gravity is used as a floor insulator by less than three 0.03 g/cm, even if cushioning properties fall extremely and harden the tapetum, the subduction at the time of a load may arise. Moreover, it is because the fall of the noise insulation engine performance, a degree of comfort, etc. may arise when 0.06 g/cm3 is exceeded, and the flattery nature at the time of shaping may also get worse.
[0019] Furthermore, the thickness of a surface layer and a tooth-back layer is **** about considering as the range of 5-15mm. By less than 5mm, this thickness of the effectiveness of a microfiber nature nonwoven fabric is small, and, as for the high absorption-of-sound engine performance, may not be obtained. On the other hand, when thickness exceeds 15mm, the thickness of the whole layered product becomes thick too much, and may pose an installation top problem.
[0020] On the other hand, the thickness of the tapetum needs to carry out by 2 to 5 times the thickness of a surface layer. As for the thickness of the tapetum, in the case of 3 layer structures, it is desirable to consider as two to 5 times to a layer with thick thickness among a surface layer and a tooth-back layer. By under 2 double, the air spring of the nonwoven fabric made from a microfiber may be reduced greatly, a dynamic spring may become large, and insulation may be inferior. On the other hand, when 5 times are exceeded, it is because the thickness of the whole layered product

becomes thick too much and may pose an installation top problem.
[0021] Moreover, as for the nonwoven fabric which constitutes the tapetum, it is desirable to consist of the fiber which has the diameter of fiber of the range of 1-50 deniers, and it is desirable that average apparent density gravity considers as the range of 0.01 - 0.07 g/cm3. Cushioning properties with the diameter of fiber moderate in less than 1 denier may be difficult to get, and endurance may also fall. Furthermore, the degree of ****** falls sharply or there is a possibility that card permeability may be bad and the quality of a nonwoven fabric may deteriorate. On the other hand, when it exceeds 50 deniers, a nonwoven fabric may become hard too much, a dynamic spring constant may become large, and insulation may fall.Moreover, when cushioning properties and endurance fall sharply and average apparent density gravity exceeds 0.07 g/cm3 in less than three 0.01 g/cm, the air spring of the tapetum can become large, cannot reduce the air spring of the nonwoven fabric made from a microfiber, and insulation will be inferior, and also it will be contrary also to the demand of lightweight-izing.
[0022] Moreover, in this invention, it is desirable to constitute the nonwoven fabric which constitutes the tapetum from at least two kinds of polyester fiber, to make 60 - 95% of the weight of fiber 1 into a polyethylene terephthalate fiber, and to consider as the polyester fiber which has the sheath-core structure where the melting point of a sheath is copolymerized polyester lower 100 degrees C or more than that of fiber 1 about 5 - 40% of the weight of fiber 2. Here, let fiber 1 be a polyethylene terephthalate fiber for making large melting point width of face of the binder fiber which can secure and choose the difference of the melting point with binder fiber.
[0023] Moreover, fiber 2 functions as binder fiber. Since it laps with the melting point of the microfiber of the polypropylene nature which constitutes the surface layer and the tooth-back layer as the difference of the melting point is less than 100 degrees C, the melting point of the sheath of fiber 2 is made lower 100 degrees C or more than fiber 1 because the temperature conditions at the time of shaping become severe. A microfiber fuses depending on the case and the expected engine performance may not be obtained. Although it is not limited especially since a melting point difference does not become a problem even if it is too large, above 150 degrees C, the melting point of fiber 2 falls too much, and handling becomes difficult. Moreover, although especially the quality of the material of the core part of fiber 2 is not limited, either, in order to carry out that it is easy to make it function as binder fiber, considering as polyethylene terephthalate is desirable.
[0024] Making fiber 1 and making fiber 2 into 5 - 40 % of the weight 60 to 95% of the weight is based on the following reasons. That is, when fiber 1 exceeds and fiber 2 exceeds 40 % of the weight less than 60% of the weight, there are too many amounts of binder fiber, and they may cause the rise of cost, and aggravation of cushioning properties. Moreover, fiber 1 exceeds 95 % of the weight, when fiber 2 is less than 5 % of the weight, there are too few amounts of binder fiber, and a moldability and endurance may fall.
[0025] Moreover, as for the thickness of the whole laminating structure, it is desirable to be referred to as about 20-50mm so that good absorption of sound and the noise insulation engine performance may be maintained and it may not become an installation top problem. Moreover, the sound-insulating-construction object of this invention can be suitably used as dash insulators and floor insulators, such as an automobile.
[0026]
[Example] Hereafter, although an example, the example of a comparison, and the conventional

example explain this invention to a detail further, this invention is not limited to these examples. 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 1) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 6 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0027] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 2) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.04 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0028] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 3) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.06 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0029] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 4) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 13 denier x51mm polyester fiber : 30mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0030] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 5) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.04 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 25mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.06 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0031] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 6) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):10% sheath-core type [2 denier x51mm], 90% Fiber combination 6 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0032] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 7) The microfiber nonwoven fabric made from polypropylene of

average apparent-density-gravity 0.05 g/cm3 in a surface layer and a tooth-back layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 6 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0033] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 8) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 in a surface layer and a tooth-back layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.04 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0034] 10mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 9) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 20mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.06 g/cm3 to the tapetum The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tooth-back layer 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 6mm, and the average apparent density gravity of 0.04g/cm, and the sound-insulating-construction object for automobiles was created.

[0035] 3 micrometers of diameters of average fiber obtained by the melt blow process, (Example 10) The microfiber nonwoven fabric made from polypropylene of 8mm in thickness, and average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 13 denier x51mm polyester fiber : 30mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 to the tapetum The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tooth-back layer 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 8mm, and the average apparent density gravity of 0.04g/cm, and the sound-insulating-construction object for automobiles was created.

[0036] In the foaming-in-place mold which has 30mm path clearance, as polyol Propylene oxide 1 and 2, the 6-hexane triol:100 section, (Conventional example 1) Water : A liquid and the tolylene diisocyanate:100 section which consist of the two sections, the surface-active-agent:1 section, and the carbon black:0.5 section, Silicone oil: Carry out low voltage impregnation, B liquid which consists of the 0.5 sections was made to foam to the 1.25 times many isocyanate [as this] equivalent to polyol, the urethane foam of 30mm in thickness and average apparent-density-gravity 0.06 g/cm3 was obtained, and it considered as the sound-insulating-construction object for automobiles.

[0037] (Conventional example 2) It considered as the sound-insulating-construction object for automobiles using the felt (trade name FERU top) of 30mm in the product made from the Toyokazu fiber industry, and thickness, and average apparent-density-gravity 0.06 g/cm3.

[0038] Fiber combination 6 denier x51mm polyester fiber: (Conventional example 3) It considered as the sound-insulating-construction object for automobiles 80% using the nonwoven fabric made

from polyester of 30mm in thickness, and average apparent-density-gravity 0.05 g/cm3 at binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm].

[0039] (Conventional example 4) It considered as the sound-insulating-construction object for automobiles using the microfiber nonwoven fabric made from polypropylene of 30mm in 3 micrometers of diameters of average fiber obtained by the melt blow process, and thickness, and average apparent-density-gravity 0.05 g/cm3.

[0040] Fiber combination 6 denier x51mm polyester fiber : 80%, (Example 1 of a comparison) At 20%, Binder fiber sheath-core type [2 denier x51mm] (sheath melting point of 110 degrees C) : 20mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 to a surface layer The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tapetum 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 8mm, and the average apparent density gravity of 0.05g/cm, and the sound-insulating-construction object for automobiles was created.

[0041] Fiber combination 6 denier x51mm polyester fiber : 80%, (Example 2 of a comparison) At 20%, Binder fiber sheath-core type [2 denier x51mm] (sheath melting point of 110 degrees C) : 10mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 to a surface layer The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tapetum 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 20mm, and the average apparent density gravity of 0.05g/cm, and the sound-insulating-construction object for automobiles was created.

[0042] 2mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 3 of a comparison) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.04 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 6 denier x51mm polyester fiber : 30mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0043] Fiber combination 6 denier x51mm polyester fiber : 80%, (Example 4 of a comparison) At 20%, Binder fiber sheath-core type [2 denier x51mm] (sheath melting point of 110 degrees C) : 10mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 in a surface layer and a tooth-back layer The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tapetum 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 10mm, and the average apparent density gravity of 0.04g/cm, and the sound-insulating-construction object for automobiles was created.

[0044] Fiber combination 6 denier x51mm polyester fiber : 80%, (Example 5 of a comparison) At 20%, Binder fiber sheath-core type [2 denier x51mm] (sheath melting point of 110 degrees C) : 8mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 in a surface layer and a tooth-back layer The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tapetum 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 30mm, and the average apparent density gravity of 0.04g/cm, and the sound-insulating-construction object for automobiles was created.

[0045] (Performance evaluation) The 100-1600Hz normal incidence sound absorption coefficient was measured about the sound-insulating-construction object for automobiles acquired in the

above-mentioned examples 1-10, the conventional examples 1-3, and the examples 1-5 of a comparison. Moreover, it asked for the spring constant from resonance frequency using the transmissibility-of-vibration measuring method. By the transmissibility-of-vibration measuring method, a fiber spring constant is called for for a whole spring constant from the measurement in a vacuum from the measurement in atmospheric air, respectively, and the difference serves as an air spring constant. The physical-properties data of each example, the conventional example, and the example of a comparison, an acoustic-absorptivity measurement result (500Hz, 1000Hz), and each spring constant measurement result are shown in Table 1.

[0046]

[Table 1]

	層	厚み mm	密度 g/cm3	主繊維	バインダー繊維	融点 ℃	吸音率 500Hz	1000Hz	ばね定数 全体ばね N/m	繊維ばね N/m	空気ばね N/m	総合評価 (高吸音、低ばね)
実施例1	表面層	8	0.05	超極細繊維 (3μm)			0.503	0.889	78,800	74,200	4,600	○
	内面層	20	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110						
実施例2	表面層	8	0.05	超極細繊維 (3μm)			0.533	0.883	54,300	39,000	15,300	○
	内面層	20	0.04	2d ×51mm : 80%	2d ×51mm : 20%	110						
実施例3	表面層	8	0.05	超極細繊維 (3μm)			0.562	0.886	55,600	41,900	13,700	○
	内面層	20	0.06	2d ×51mm : 80%	2d ×51mm : 20%	110						
実施例4	表面層	8	0.05	超極細繊維 (3μm)			0.612	0.902	72,300	71,100	1,200	○
	内面層	30	0.05	13d ×51mm : 80%	2d ×51mm : 20%	110						
実施例5	表面層	8	0.04	超極細繊維 (3μm)			0.623	0.899	48,600	35,600	13,000	○
	内面層	25	0.06	2d ×51mm : 80%	2d ×51mm : 20%	110						
実施例6	表面層	8	0.05	超極細繊維 (3μm)			0.512	0.896	76,500	72,600	3,900	○
	内面層	20	0.05	6d ×51mm : 90%	2d ×51mm : 10%	110						
実施例7	表面層	8	0.05	超極細繊維 (3μm)			0.654	0.883	53,500	50,900	2,600	○
	内面層	20	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110						
	背面層	8	0.05	超極細繊維 (3μm)								
実施例8	表面層	8	0.05	超極細繊維 (3μm)			0.688	0.855	40,600	32,000	8,600	○
	内面層	20	0.04	2d ×51mm : 80%	2d ×51mm : 20%	110						
	背面層	8	0.05	超極細繊維 (3μm)								
実施例9	表面層	10	0.05	超極細繊維 (3μm)			0.718	0.848	47,400	34,600	12,800	○
	内面層	20	0.06	2d ×51mm : 80%	2d ×51mm : 20%	110						
	背面層	6	0.04	超極細繊維 (3μm)								
実施例10	表面層	8	0.05	超極細繊維 (3μm)			0.695	0.869	46,500	35,700	10,800	○
	内面層	30	0.05	13d ×51mm : 80%	2d ×51mm : 20%	110						
	背面層	8	0.04	超極細繊維 (3μm)								
従来例1		30	0.06	ウレタンフォーム			0.189	0.463	96,100			×
従来例2		30	0.06	フェルト			0.201	0.479	65,700	56,200	9,500	×
従来例3		30	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110	0.230	0.530	53,000	49,800	3,200	×
従来例4		30	0.05	超極細繊維 (3μm)			0.633	0.798	341,000	42,900	298,100	×
比較例1	表面層	20	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110	0.241	0.546	78,800	74,200	4,600	×
	内面層	8	0.05	超極細繊維 (3μm)								
比較例2	表面層	10	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110	0.290	0.665	258,000	76,000	182,000	×
	内面層	20	0.05	超極細繊維 (3μm)								
比較例3	表面層	2	0.04	超極細繊維 (3μm)			0.205	0.461	72,500	69,900	2,600	×
	内面層	30	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110						
比較例4	表面層	10	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110	0.264	0.623	153,600	49,300	104,300	×
	内面層	10	0.04	超極細繊維 (3μm)								
	背面層	10	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110						
比較例5	表面層	8	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110	0.695	0.869	305,000	34,500	270,500	×
	内面層	30	0.04	超極細繊維 (3μm)								
	背面層	8	0.05	6d ×51mm : 80%	2d ×51mm : 20%	110						

[0047] The various sound-insulating-construction objects for automobiles created in the example maintaining a high acoustic absorptivity compared with the conventional example, the spring constant is low stopped by Table 1 and it was checked from it that it is the sound-insulating-construction object for automobiles with which high absorption-of-sound nature and low spring-ization were compatible. Moreover, from Table 1, coexistence of high absorption-of-sound nature and the reduction in a spring was not achieved, but the sound-insulating-construction object for automobiles of the example of a comparison which is not in the range of this invention was compared with the sound-insulating-construction object for

automobiles of an example, and it was checked that the engine performance is inferior.
[0048]
[Effect of the Invention] Since thickness, a consistency, etc. of the tapetum which multilayers a sound-insulating-construction object, arranges a microfiber nonwoven fabric on the surface layer used as the plane of incidence of a main sound, and is located in the thickness, the consistency, and the opposite side of a surface layer were specified according to this invention as explained above, The sound-insulating-construction object for automobiles with which high absorption-of-sound nature and high insulation (reduction in a spring) were compatible can be offered by stopping a spring constant low, maintaining the high absorption-of-sound nature which is the big features which a microfiber nonwoven fabric has.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the sound-insulating-construction object for automobiles of high performance, and is suitably used about the sound-insulating-construction object for automobiles which reconciled the high absorption-of-sound engine performance and the noise insulation engine performance in more detail as interior sound absorption and insulation materials for automobiles, such as a dash insulator for automobiles attached in the sound absorption and insulation material for automobiles, a floor insulator, and a dash panel.

PRIOR ART

[Description of the Prior Art] In recent years, the good noise insulation engine performance and the absorption-of-sound engine performance are demanded of the interior material for automobiles especially the floor insulator, or the dash insulator, and the felt and urethane foam were conventionally used as this sound-insulating-construction object for automobiles in many cases. However, since formativeness originates in a bad thing and adhesion with a panel worsens, generally the felt is inferior in sound-absorbing-and-insulating ability. Moreover, when used for a floor insulator etc., irregularity by the wire harness laid may be unable to be absorbed, irregularity may occur on carpet epidermis, and appearance may worsen. Furthermore, since the natural fiber is contained in the fiber which ****(ed), the stability on quality is missing. In addition, since association between fiber was weak, there was a fault of producing setting with time.
[0003] On the other hand, in using urethane foam as a sound-insulating-construction object, the adhesion process of carpet epidermis and urethane foam is needed, and it becomes high cost. Although the approach of throwing in carpet epidermis and an urethane foaming raw material in a foaming mold, and really fabricating is also developed, since resin impregnation and a foaming fixing process are needed, productivity is inferior, and also in order for a facility to also become large-scale and to use the raw material of urethane foam, work environment is bad and an exhaust air facility is needed. Furthermore, preferably, since recycle is difficult and poses an environment top problem, since it is hard compared with the felt, the noise insulation engine performance is also inferior in urethane foam.
[0004] In order to improve this fault, the sound-insulating-construction object which

used synthetic-fiber nonwoven fabrics, such as polyester, is indicated by JP,62-223357,A, JP,4-272263,A, and JP,4-185754,A. By the way, the thermal bond type nonwoven fabric made from a synthetic fiber using thermal melting arrival fiber (binder fiber) is changing the loadings of binder fiber, the diameter of fiber, and apparent density gravity, and can control a spring constant and the absorption-of-sound engine performance. That is, tuning of the resonance point is possible and the good noise insulation engine performance is obtained by shifting the resonance point of the big frequency of a noise input, and a sound-insulating-construction object.

[0005] However, when covering the field where the big frequency of a noise input is large, just the tuning of the resonance point of noise insulation is inadequate, and high damping-ization of a sound-insulating-construction object is needed. However, it is difficult for the sound-insulating-construction object using the conventional felt and urethane foam, or a synthetic-fiber nonwoven fabric to realize high damping, and the control is also difficult for the present condition. For this reason, a sound-insulating-construction object is made into multilayer structure, and the sound-insulating-construction object which consists of the microfiber nonwoven fabric obtained by the melt blow process in one layer of the structure is devised (Japanese Patent Application No. No. 151549 [seven to]).

EFFECT OF THE INVENTION

[Effect of the Invention] Since thickness, a consistency, etc. of the tapetum which multilayers a sound-insulating-construction object, arranges a microfiber nonwoven fabric on the surface layer used as the plane of incidence of a main sound, and is located in the thickness, the consistency, and the opposite side of a surface layer were specified according to this invention as explained above, The sound-insulating-construction object for automobiles with which high absorption-of-sound nature and high insulation (reduction in a spring) were compatible can be offered by stopping a spring constant low, maintaining the high absorption-of-sound nature which is the big features which a microfiber nonwoven fabric has.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By using the above-mentioned multilayer mold sound-insulating-construction object, it excels in the damping engine performance, and control of a damping property is possible. However, with this multilayer mold sound-insulating-construction object, since a microfiber layer is located in the opposite side or the middle to the plane of incidence of a main sound, the high absorption-of-sound nature which is the big description which a microfiber nonwoven fabric has cannot be demonstrated. Moreover, the microfiber nonwoven fabric had the very large dynamic spring constant from the first, and when the thickness of other layers was not enough secured to the microfiber layer, the spring constant increased and it had the technical problem of the noise insulation engine performance falling. Furthermore, although the engine performance of a sound absorbing and insulating structure was mainly decided by the absorption-of-sound

engine performance and the spring property, these two engine performance had an antinomy-side face, and coexistence was difficult for high absorption-of-sound nature and the reduction in a spring.
[0007] Maintaining the high absorption-of-sound nature which is the big features which a microfiber nonwoven fabric has, the place which this invention is made in view of the technical problem which such a conventional technique has, and is made into the purpose is stopping a spring constant low, and is to offer the sound-insulating-construction object for automobiles which combined high absorption-of-sound nature and high insulation (reduction in a spring).
MEANS

[Means for Solving the Problem] As a result of inquiring wholeheartedly that this invention persons should solve the above-mentioned technical problem, the high absorption-of-sound engine performance of the microfiber nonwoven fabric like **** originating in mixing of two kinds of absorption-of-sound gestalten, a film resonance absorption-of-sound gestalt and a vesicular structure absorption-of-sound gestalt, and the dynamic spring constant of a microfiber nonwoven fabric carried out the knowledge of the air spring occupying the most. Then, the sound-insulating-construction object was multilayered and the microfiber nonwoven fabric was arranged on the surface layer used as the plane of incidence of a main sound, and when thickness, a consistency, etc. of the tapetum located in the thickness, the consistency, and the opposite side of a surface layer were specified, it came to complete a header and this invention for the above-mentioned technical problem being solved.
[0009] Namely, the sound-insulating-construction object for automobiles of this invention is the laminating structure which consists of the fiber aggregate more than the bilayer from which fiber combination differs. They are the average apparent density gravity 0.03 which consists of fiber of 0.1-10 micrometers of diameters of fiber from which the surface layer used as the plane of incidence of a main sound is obtained by the melt blow process - 0.06 g/cm3, and a nonwoven fabric made from polypropylene with a thickness of 5-15mm. It is characterized by the thickness of the tapetum located in the opposite side to the plane of incidence of a sound being 2 to 5 times the above-mentioned surface layer.
OPERATION

[Function] Like ****, the absorption-of-sound engine performance of the microfiber nonwoven fabric made from polypropylene this invention persons being high originating in mixing of two kinds of absorption-of-sound gestalten, a film resonance absorption-of-sound gestalt and a vesicular structure absorption-of-sound gestalt, and the dynamic spring constant of the microfiber nonwoven fabric made from polypropylene solved that the air spring occupied the most.
[0011] That is, since the diameter of fiber is thin compared with the conventional synthetic-fiber nonwoven fabric, fiber surface area is very large and the microfiber nonwoven fabric made from polypropylene has large friction with flow air. For this reason, the microfiber nonwoven fabric made from polypropylene has very large

ventilation resistance, a part of surface of a nonwoven fabric acted as film, and it has caused absorption of sound by film resonance. The high absorption-of-sound engine performance near 500Hz in which it does not see mainly originates in the conventional synthetic-fiber nonwoven fabric at this.

[0012] In this invention, absorption of sound can be made to be able to cause by film resonance by arranging in the surface layer used as the plane of incidence of the main sound of the sound-insulating-construction object which multilayered the microfiber nonwoven fabric made from polypropylene, and the high absorption-of-sound engine performance almost equivalent to the microfiber nonwoven fabric independent made from polypropylene can be obtained. Moreover, a sound-insulating-construction object can be made into the three-layer structure which consists of a surface layer, the tapetum, and a tooth-back layer sequentially from the direction of incidence of a main sound, and the high absorption-of-sound engine performance can be given for a surface layer and a tooth-back layer also to the microfiber nonwoven fabric made from polypropylene, then not only a main sound source but a reflected sound, etc.

[0013] By the way, although the dynamic spring constant consists of a fiber spring and an air spring, the high ventilation resistance nature suffered misfortune, the air spring of the microfiber nonwoven fabric made from polypropylene has reached about ten times from several times to the fiber spring, and the noise insulation engine performance becomes [a dynamic spring constant] very large low in the microfiber nonwoven fabric independent made from polypropylene. So, by this invention, a laminating is carried out to the small nonwoven fabric made from polyester fiber of the ventilation resistance which has one 2 to 5 times the thickness of this to the thickness of the microfiber nonwoven fabric made from polypropylene, and the dynamic spring constant is sharply made small by reducing the air spring of the whole sound-insulating-construction object.

[0014] The outstanding absorption-of-sound engine performance and the outstanding noise insulation engine performance can be reconciled by multilayering a sound-insulating-construction object, arranging the microfiber nonwoven fabric made from polypropylene on the surface layer used as the plane of incidence of a main sound, and giving one 2 to 5 times the thickness of this to the tapetum located in the opposite side to the plane of incidence of a sound from the above knowledge, to a surface layer in this invention.

[0015]

[Embodiment of the Invention] Hereafter, the sound-insulating-construction object for automobiles of this invention is explained to a detail. Although the multilayer mold sound-insulating-construction object of this invention is equipped with a surface layer and the tapetum like ****, it calls the tapetum the field located in the opposite side to the plane of incidence of a surface layer and a sound in the plane of incidence of a main sound. Moreover, in making 3 layer structure, it calls it a surface layer, the tapetum, and a tooth-back layer sequentially from the direction of incidence of a main sound. The outline of the configuration of the sound-insulating-construction object of this invention is shown in drawing 1 and 2.

[0016] In the sound-insulating-construction object of this invention, the nonwoven fabric which constitutes a surface layer and a tooth-back layer consists of the

microfiber obtained by the melt blow process. As the quality of the material of fiber, the ease of manufacture to cost and polypropylene are desirable. Moreover, as for the nonwoven fabric which constitutes the tapetum, it is desirable that it is a product made from polyester fiber, judging from cost, a moldability, endurance, the engine-performance stability after processing, etc.

[0017] Moreover, the above-mentioned surface layer and a tooth-back layer need to constitute from a nonwoven fabric which consists of the microfiber of 0.1-10 micrometers of diameters of fiber obtained by the melt blow process. This is because ventilation resistance to the extent that film absorption of sound is caused will not be obtained if acquisition of less than 0.1-micrometer fiber is difficult, and its diameter of fiber is difficult to get in the rigidity as shock absorbing material and another side and the diameter of fiber exceed 10 micrometers, but the absorption-of-sound engine performance may get worse.

[0018] The average apparent density gravity of a surface layer and a tooth-back layer is **** about considering as the range of 0.03 - 0.06 g/cm3. When average apparent density gravity is used as a floor insulator by less than three 0.03 g/cm, even if cushioning properties fall extremely and harden the tapetum, the subduction at the time of a load may arise. Moreover, it is because the fall of the noise insulation engine performance, a degree of comfort, etc. may arise when 0.06 g/cm3 is exceeded, and the flattery nature at the time of shaping may also get worse.

[0019] Furthermore, the thickness of a surface layer and a tooth-back layer is **** about considering as the range of 5-15mm. By less than 5mm, this thickness of the effectiveness of a microfiber nature nonwoven fabric is small, and, as for the high absorption-of-sound engine performance, may not be obtained. On the other hand, when thickness exceeds 15mm, the thickness of the whole layered product becomes thick too much, and may pose an installation top problem.

[0020] On the other hand, the thickness of the tapetum needs to carry out by 2 to 5 times the thickness of a surface layer. As for the thickness of the tapetum, in the case of 3 layer structures, it is desirable to consider as two to 5 times to a layer with thick thickness among a surface layer and a tooth-back layer. By under 2 double, the air spring of the nonwoven fabric made from a microfiber may be reduced greatly, a dynamic spring may become large, and insulation may be inferior. On the other hand, when 5 times are exceeded, it is because the thickness of the whole layered product becomes thick too much and may pose an installation top problem.

[0021] Moreover, as for the nonwoven fabric which constitutes the tapetum, it is desirable to consist of the fiber which has the diameter of fiber of the range of 1-50 deniers, and it is desirable that average apparent density gravity considers as the range of 0.01 - 0.07 g/cm3. Cushioning properties with the diameter of fiber moderate in less than 1 denier may be difficult to get, and endurance may also fall. Furthermore, the degree of ****** falls sharply or there is a possibility that card permeability may be bad and the quality of a nonwoven fabric may deteriorate. On the other hand, when it exceeds 50 deniers, a nonwoven fabric may become hard too much, a dynamic spring constant may become large, and insulation may fall. Moreover, when cushioning properties and endurance fall sharply and average apparent density gravity exceeds 0.07 g/cm3 in less than three 0.01 g/cm, the air spring of the tapetum can become large,

cannot reduce the air spring of the nonwoven fabric made from a microfiber, and insulation will be inferior, and also it will be contrary also to the demand of lightweight-izing.

[0022] Moreover, in this invention, it is desirable to constitute the nonwoven fabric which constitutes the tapetum from at least two kinds of polyester fiber, to make 60 - 95% of the weight of fiber 1 into a polyethylene terephthalate fiber, and to consider as the polyester fiber which has the sheath-core structure where the melting point of a sheath is copolymerized polyester lower 100 degrees C or more than that of fiber 1 about 5 - 40% of the weight of fiber 2. Here, let fiber 1 be a polyethylene terephthalate fiber for making large melting point width of face of the binder fiber which can secure and choose the difference of the melting point with binder fiber.

[0023] Moreover, fiber 2 functions as binder fiber. Since it laps with the melting point of the microfiber of the polypropylene nature which constitutes the surface layer and the tooth-back layer as the difference of the melting point is less than 100 degrees C, the melting point of the sheath of fiber 2 is made lower 100 degrees C or more than fiber 1 because the temperature conditions at the time of shaping become severe. A microfiber fuses depending on the case and the expected engine performance may not be obtained. Although it is not limited especially since a melting point difference does not become a problem even if it is too large, above 150 degrees C, the melting point of fiber 2 falls too much, and handling becomes difficult. Moreover, although especially the quality of the material of the core part of fiber 2 is not limited, either, in order to carry out that it is easy to make it function as binder fiber, considering as polyethylene terephthalate is desirable.

[0024] Making fiber 1 and making fiber 2 into 5 - 40 % of the weight 60 to 95% of the weight is based on the following reasons. That is, when fiber 1 exceeds and fiber 2 exceeds 40 % of the weight less than 60% of the weight, there are too many amounts of binder fiber, and they may cause the rise of cost, and aggravation of cushioning properties. Moreover, fiber 1 exceeds 95 % of the weight, when fiber 2 is less than 5 % of the weight, there are too few amounts of binder fiber, and a moldability and endurance may fall.

[0025] Moreover, as for the thickness of the whole laminating structure, it is desirable to be referred to as about 20-50mm so that good absorption of sound and the noise insulation engine performance may be maintained and it may not become an installation top problem. Moreover, the sound-insulating-construction object of this invention can be suitably used as dash insulators and floor insulators, such as an automobile.

EXAMPLE

[Example] Hereafter, although an example, the example of a comparison, and the conventional example explain this invention to a detail further, this invention is not limited to these examples.

8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 1) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier

x51mm], 80% Fiber combination 6 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0027] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 2) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.04 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0028] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 3) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.06 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0029] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 4) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 13 denier x51mm polyester fiber : 30mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0030] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 5) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.04 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 25mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.06 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0031] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 6) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):10% sheath-core type [2 denier x51mm], 90% Fiber combination 6 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.

[0032] 8mm in 3 micrometers of diameters of average fiber, thickness which are

obtained by the melt blow process, (Example 7) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 in a surface layer and a tooth-back layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 6 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.
[0033] 8mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 8) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 in a surface layer and a tooth-back layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 20mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.04 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.
[0034] 10mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 9) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 2 denier x51mm polyester fiber : 20mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.06 g/cm3 to the tapetum The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tooth-back layer 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 6mm, and the average apparent density gravity of 0.04g/cm, and the sound-insulating-construction object for automobiles was created.
[0035] 3 micrometers of diameters of average fiber obtained by the melt blow process, (Example 10) The microfiber nonwoven fabric made from polypropylene of 8mm in thickness, and average apparent-density-gravity 0.05 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 13 denier x51mm polyester fiber : 30mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 to the tapetum The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tooth-back layer 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 8mm, and the average apparent density gravity of 0.04g/cm, and the sound-insulating-construction object for automobiles was created.
[0036] In the foaming-in-place mold which has 30mm path clearance, as polyol Propylene oxide 1 and 2, the 6-hexane triol:100 section, (Conventional example 1)Water : A liquid and the tolylene diisocyanate:100 section which consist of the two sections, the surface-active-agent:1 section, and the carbon black:0.5 section, Silicone oil: Carry out low voltage impregnation, B liquid which consists of the 0.5 sections was made to foam to the 1.25 times many isocyanate [as this] equivalent to polyol, the urethane foam of 30mm in thickness and average apparent-density-gravity 0.06 g/cm3 was obtained, and it considered as the sound-insulating-construction object for automobiles.

[0037] (Conventional example 2) It considered as the sound-insulating-construction object for automobiles using the felt (trade name FERU top) of 30mm in the product made from the Toyokazu fiber industry, and thickness, and average apparent-density-gravity 0.06 g/cm3.
[0038] Fiber combination 6 denier x51mm polyester fiber: (Conventional example 3) It considered as the sound-insulating-construction object for automobiles 80% using the nonwoven fabric made from polyester of 30mm in thickness, and average apparent-density-gravity 0.05 g/cm3 at binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm].
[0039] (Conventional example 4) It considered as the sound-insulating-construction object for automobiles using the microfiber nonwoven fabric made from polypropylene of 30mm in 3 micrometers of diameters of average fiber obtained by the melt blow process, and thickness, and average apparent-density-gravity 0.05 g/cm3.
[0040] Fiber combination 6 denier x51mm polyester fiber : 80%, (Example 1 of a comparison) At 20%, Binder fiber sheath-core type [2 denier x51mm] (sheath melting point of 110 degrees C) : 20mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 to a surface layer The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tapetum 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 8mm, and the average apparent density gravity of 0.05g/cm, and the sound-insulating-construction object for automobiles was created.
[0041] Fiber combination 6 denier x51mm polyester fiber : 80%, (Example 2 of a comparison) At 20%, Binder fiber sheath-core type [2 denier x51mm] (sheath melting point of 110 degrees C) : 10mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 to a surface layer The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tapetum 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 20mm, and the average apparent density gravity of 0.05g/cm, and the sound-insulating-construction object for automobiles was created.
[0042] 2mm in 3 micrometers of diameters of average fiber, thickness which are obtained by the melt blow process, (Example 3 of a comparison) The microfiber nonwoven fabric made from polypropylene of average apparent-density-gravity 0.04 g/cm3 to a surface layer At binder fiber (sheath melting point of 110 degrees C):20% sheath-core type [2 denier x51mm], 80% Fiber combination 6 denier x51mm polyester fiber : 30mm in thickness The laminating of the nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 was used and carried out to the tapetum, and the sound-insulating-construction object for automobiles was created.
[0043] Fiber combination 6 denier x51mm polyester fiber : 80%, (Example 4 of a comparison) At 20%, Binder fiber sheath-core type [2 denier x51mm] (sheath melting point of 110 degrees C) : 10mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 in a surface layer and a tooth-back layer The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tapetum 3 micrometers of diameters of average fiber obtained by the melt blow process, the thickness of 10mm, and the average apparent density gravity of 0.04g/cm, and the sound-insulating-construction object for automobiles was created.
[0044] Fiber combination 6 denier x51mm polyester fiber : 80%, (Example 5 of a comparison) At 20%, Binder fiber sheath-core type [2 denier x51mm] (sheath melting point of 110 degrees C) : 8mm in thickness The nonwoven fabric made from polyester of average apparent-density-gravity 0.05 g/cm3 in a surface layer and a tooth-back layer The laminating of the microfiber nonwoven fabric made from polypropylene of 3 was used and carried out to the tapetum 3 micrometers of

diameters of average fiber obtained by the melt blow process, the thickness of 30mm, and the average apparent density gravity of 0.04g/cm, and the sound-insulating-construction object for automobiles was created.

[0045] (Performance evaluation) The 100-1600Hz normal incidence sound absorption coefficient was measured about the sound-insulating-construction object for automobiles acquired in the above-mentioned examples 1-10, the conventional examples 1-3, and the examples 1-5 of a comparison. Moreover, it asked for the spring constant from resonance frequency using the transmissibility-of-vibration measuring method. By the transmissibility-of-vibration measuring method, a fiber spring constant is called for for a whole spring constant from the measurement in a vacuum from the measurement in atmospheric air, respectively, and the difference serves as an air spring constant. The physical-properties data of each example, the conventional example, and the example of a comparison, an acoustic-absorptivity measurement result (500Hz, 1000Hz), and each spring constant measurement result are shown in Table 1.

[0046]

[Table 1]

	層	厚み mm	密度 g/cm3	主繊維	バインダー繊維	融点 ℃	吸音率 500Hz	1000Hz	ばね定数 全体ばね N/m	繊維ばね N/m	空気ばね N/m	総合評価 (高吸音、低ばね)
実施例1	表面層 内面層	8 20	0.05 0.05	超極細繊維 (3μm) 6d×51mm：80%	 2d×51mm：20%	 110	0.503	0.889	78,800	74,200	4,600	○
実施例2	表面層 内面層	8 20	0.05 0.04	超極細繊維 (3μm) 2d×51mm：80%	 2d×51mm：20%	 110	0.533	0.883	54,300	39,000	15,300	○
実施例3	表面層 内面層	8 20	0.05 0.06	超極細繊維 (3μm) 2d×51mm：80%	 2d×51mm：20%	 110	0.562	0.886	55,600	41,900	13,700	○
実施例4	表面層 内面層	8 30	0.05 0.05	超極細繊維 (3μm) 13d×51mm：80%	 2d×51mm：20%	 110	0.612	0.902	72,300	71,100	1,200	○
実施例5	表面層 内面層	8 25	0.04 0.06	超極細繊維 (3μm) 2d×51mm：80%	 2d×51mm：20%	 110	0.623	0.899	48,600	35,600	13,000	○
実施例6	表面層 内面層	8 20	0.05 0.05	超極細繊維 (3μm) 6d×51mm：90%	 2d×51mm：10%	 110	0.512	0.896	76,500	72,600	3,900	○
実施例7	表面層 内面層 背面層	8 20 8	0.05 0.05 0.05	超極細繊維 (3μm) 6d×51mm：80% 超極細繊維 (3μm)	 2d×51mm：20% 	 110 	0.654	0.883	53,500	50,900	2,600	○
実施例8	表面層 内面層 背面層	8 20 8	0.05 0.04 0.05	超極細繊維 (3μm) 2d×51mm：80% 超極細繊維 (3μm)	 2d×51mm：20% 	 110 	0.688	0.855	40,600	32,000	8,600	○
実施例9	表面層 内面層 背面層	10 20 6	0.05 0.06 0.04	超極細繊維 (3μm) 2d×51mm：80% 超極細繊維 (3μm)	 2d×51mm：20% 	 110 	0.718	0.848	47,400	34,600	12,800	○
実施例１０	表面層 内面層 背面層	8 30 8	0.05 0.05 0.04	超極細繊維 (3μm) 13d×51mm：80% 超極細繊維 (3μm)	 2d×51mm：20% 	 110 	0.695	0.869	46,500	35,700	10,800	○
従来例1		30	0.06	ウレタンフォーム			0.189	0.463	96,100			×
従来例2		30	0.06	フェルト			0.201	0.479	65,700	56,200	9,500	×
従来例3		30	0.05	6d×51mm：80%	2d×51mm：20%	110	0.230	0.530	53,000	49,800	3,200	×
従来例4		30	0.05	超極細繊維 (3μm)			0.633	0.798	341,000	42,900	298,100	×
比較例1	表面層 内面層	20 8	0.05 0.05	6d×51mm：80% 超極細繊維 (3μm)	2d×51mm：20% 	110 	0.241	0.546	78,800	74,200	4,600	×
比較例2	表面層 内面層	10 20	0.05 0.05	6d×51mm：80% 超極細繊維 (3μm)	2d×51mm：20% 	110 	0.290	0.665	258,000	76,000	182,000	×
比較例3	表面層 内面層	2 30	0.04 0.05	超極細繊維 (3μm) 6d×51mm：80%	 2d×51mm：20%	 110	0.205	0.461	72,500	69,900	2,600	×
比較例4	表面層 内面層 背面層	10 10 10	0.05 0.04 0.05	6d×51mm：80% 超極細繊維 (3μm) 6d×51mm：80%	2d×51mm：20% 2d×51mm：20%	110 110	0.264	0.623	153,600	49,300	104,300	×
比較例5	表面層 内面層 背面層	8 30 8	0.05 0.04 0.05	6d×51mm：80% 超極細繊維 (3μm) 6d×51mm：80%	2d×51mm：20% 2d×51mm：20%	110 110	0.695	0.869	305,000	34,500	270,500	×

[0047] The various sound-insulating-construction objects for automobiles created in the example maintaining a high acoustic absorptivity compared with the conventional example, the spring constant is low stopped by Table 1 and it was checked from it that it is the sound-insulating-construction object for automobiles with which high absorption-of-sound nature and low spring-ization were compatible. Moreover, from Table 1, coexistence of high absorption-of-sound nature and the reduction in a spring was not achieved, but the sound-insulating-construction object for automobiles of the example of a comparison which is not in the range of this invention was compared with the sound-insulating-construction object for

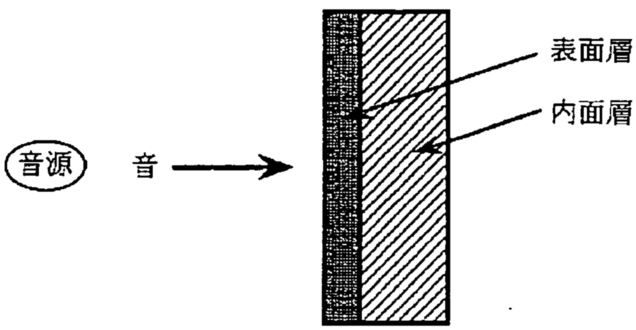
automobiles of an example, and it was checked that the engine performance is inferior.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the schematic diagram showing the example of a configuration of the sound-insulating-construction object of this invention (bilayer).
[Drawing 2] It is the schematic diagram showing the example of a configuration of the sound-insulating-construction object of this invention (three layers).

DRAWINGS

[Drawing 1]



[Drawing 2]